1) $\left(\frac{3}{4}\sqrt[3]{a^2}+\frac{2}{3}\sqrt{a}\right)^{14}$

$k = ?$

$T_{k+1} = C_{14}^{k}\cdot\left(\frac{3}{4}\cdot a^{\frac{2}{3}}\right)^{14-k}\cdot\left(\frac{2}{3}\cdot a^{\frac{1}{2}}\right)^{k}$

$= C_{14}^{k}\cdot\left(\frac{3}{4}\right)^{14-k}\cdot\left(\frac{2}{3}\right)^{k}\cdot a^{\frac{28-2k}{3}}\cdot a^{\frac{k}{2}}$

$= C_{14}^{k}\cdot\left(\frac{3}{4}\right)^{14-k}\cdot\left(\frac{2}{3}\right)^{k}\cdot a^{\frac{56-4k+3k}{6}}$

$= C_{14}^{k}\cdot\left(\frac{3}{4}\right)^{14-k}\cdot\left(\frac{2}{3}\right)^{k}\cdot a^{\frac{56-k}{6}}$

$a^{\frac{56-k}{6}} = a^{9}$

$\frac{56-k}{6} = 9$

$-k = 54-56$

$-k = -2 \quad |\cdot(-1)$

$\boxed{k=2}$

$\Downarrow$

$T_3 = C_{14}^{2}\cdot\left(\frac{3}{4}\right)^{12}\cdot\left(\frac{2}{3}\right)^{2}\cdot a^{\frac{56-2}{6}}$

$= C_{14}^{2}\cdot\left(\frac{3}{4}\right)^{12}\cdot\left(\frac{2}{3}\right)^{2}\cdot a^{\frac{54}{6}}$

$= C_{14}^{2}\cdot\left(\frac{3}{4}\right)^{12}\cdot\left(\frac{2}{3}\right)^{2}\cdot a^{9}$

$= \frac{14!}{2!\cdot 12!}\cdot\left(\frac{3}{4}\right)^{12}\cdot\left(\frac{2}{3}\right)^{2}\cdot a^{9}$

$= \frac{\cancel{14}^{7}\cdot 13\cdot \cancel{12!}}{\cancel{2}\cdot \cancel{12!}}$

$= 91\cdot\left(\frac{3}{4}\right)^{12}\cdot\left(\frac{2}{3}\right)^{2}\cdot a^{9}$

192048234

2) $x = ?$, $T_4 = 3500000$ $\left(10^{\log\sqrt{x}} + 10^{-\frac{1}{\log x}}\right)^7$

$T_4 = T_{3+1} = C_7^3 \cdot \left(10^{\log\sqrt{x}}\right)^4 \cdot \left(10^{-\frac{1}{\log x}}\right)^3$

$3500000 = \frac{7!}{3! \cdot 4!} \cdot 10^{4\log\sqrt{x}} \cdot 10^{-\frac{3}{\log x}}$

$3500000 = \frac{7 \cdot \cancel{6} \cdot 5 \cdot \cancel{4!}}{\cancel{6} \cdot \cancel{4!}} \cdot 10^{4\log\sqrt{x} - \frac{3}{\log x}}$

$3500000 = 35 \cdot 10^{\frac{4 \cdot \log x^{\frac{1}{2}} \cdot \log x - 3}{\log x}}$ $/ : 35$

$100000 = 10^{\frac{2\log x \log x - 3}{\log x}}$

$10^5 = 10^{\frac{2\log^2 x - 3}{\log x}}$

$5 = \frac{2\log^2 x - 3}{\log x}$

$2\log^2 x - 5\log x - 3 = 0$

$\log x = t$

$2t^2 - 5t - 3 = 0$

$t_{1/2} = \frac{5 \pm \sqrt{25 + 24}}{4} = \frac{5 \pm 7}{4}$

$t_1 = -\frac{1}{2}$

$t_2 = 3$

t_1

$\log x = t_1$

$\log x = -\frac{1}{2}$

$x = 10^{-\frac{1}{2}}$

$x = \frac{1}{\sqrt{10}}$

t_2

$\log x = t_2$

$\log x = 3$

$x = 10^3$

$x = 1000$

19204 8234

3) $T_9 = 450 \quad x = ? \quad \left(\frac{\sqrt{10}}{\sqrt{x^{5\lg x}}} + x^{2\lg x}\sqrt{x}\right)^{10}$

$$T_9 = T_{8+1} = C_{10}^{8} \cdot \left(\frac{\sqrt{10}}{\sqrt{x^{5\lg x}}}\right)^2 \cdot \left(x^{2\lg x} \cdot \sqrt{x}\right)^8$$

$$450 = \frac{10!}{8! \cdot 2!} \cdot \frac{10}{x^{5\lg x}} \cdot x^{16\lg x} \cdot x^4$$

$$450 = \frac{\cancel{10} \cdot 9 \cdot \cancel{8!}}{\cancel{8!} \cdot \cancel{2}} \cdot 10 \cdot x^{-5\lg x} \cdot x^{4+16\lg x}$$

$$450 = 450 \cdot x^{-5\lg x + 4 + 16\lg x}$$

$$1 = x^{4 + 11\lg x}$$

$$x^0 = x^{4+11\lg x}$$

$$4 + 11\lg x = 0$$

$$11\lg x = -4$$

$$\lg x = -\frac{4}{11}$$

$$x = 10^{-\frac{4}{11}} = \frac{1}{\sqrt[4]{10^{11}}}$$

4) $m=?$ $(a+b)^m$ $C_m^{10} : C_m^{8} = 7:15$

$$C_m^{10} : C_m^{8} = 7:15$$

$$\frac{m!}{10!(m-10)!} : \frac{m!}{8!(m-8)!} = \frac{7}{15}$$

$$\frac{8!(m-8)\cdot(m-9)\cdot \cancel{(m-10)!}}{10\cdot 9\cdot 8\cdot \cancel{(m-10)!}} = \frac{7}{15}$$

$$(m-8)\cdot(m-9) = 6\cdot 7$$

$$m^2-9m-8m+72=42$$

$$m^2-9m-8m+72-42=0$$

$$m^2-17m+30=0$$

$$m_{1/2} = \frac{17 \pm \sqrt{289-120}}{2} = \frac{17\pm 13}{2}$$

$$m_1 = 2$$

$$m_2 = 15$$

192048234

5) $\left(\frac{\sqrt{a^4}}{\sqrt[x]{a^{x-1}}} + a^{x+1}\frac{1}{\sqrt{a^{x-1}}}\right)^8 \quad T_4 = 56\cdot a^{12}$

$$T_4 = T_{3+1} = C_8^3\left(\frac{a^{\frac{4}{5}}}{a^{\frac{x-1}{x}}}\right)^5 \cdot \left(a^{x+1}\cdot\frac{1}{\sqrt{a^{x-1}}}\right)^3$$

$$56a^{12} = \frac{8!}{3!\cdot 5!}\cdot a^{\frac{4}{5}\cdot 5}\cdot a^{\frac{-(x-1)}{x}\cdot 5}\cdot a^{3x+3}\cdot a^{\frac{-(x-1)}{2}\cdot 3}$$

$$56a^{12} = \frac{8\cdot 7\cdot \cancel{6}\cdot \cancel{5!}}{\cancel{6}\cdot \cancel{5!}}\cdot a^4\cdot a^{\frac{5-5x}{x}}\cdot a^{3x+3}\cdot a^{\frac{3-3x}{2}}$$

$$\cancel{56}a^{12} = \cancel{56}\cdot a^{\frac{8x+10-10x+6x^2+6x+3x-3x^2}{2x}}$$

$$a^{12} = a^{\frac{3x^2+7x+10}{2x}}$$

$$12 = \frac{3x^2+7x+10}{2x}$$

$$3x^2+7x+10-24x=0$$

$$3x^2-17x+10=0$$

$$x_{1/2} = \frac{17\pm\sqrt{289-120}}{6} = \frac{17\pm 13}{6}$$

$$x_1 = \frac{4}{6} = \frac{2}{3}$$

$$x_2 = \frac{30}{6} = 5$$

192048234

6)
$$\left(\frac{1}{x} - x \cdot \sqrt[3]{x^2}\right)^m$$

$$\sum C_n^k = 2^n \Rightarrow 2^n = 256$$

$$2^n = 2^8 \Rightarrow n = 8$$

$$T_{k+1} = C_8^k \cdot \left(\frac{1}{x}\right)^{8-k} \cdot (-1)^k \cdot \left(x \cdot \sqrt[3]{x^2}\right)^k$$

$$T_{k+1} = C_8^k \cdot (-1)^k \cdot x^{k-8} \cdot x^k \cdot x^{\frac{2}{3}k}$$

$$T_{k+1} = C_8^k \cdot (-1)^k \cdot x^{k-8+k+\frac{2}{3}k}$$

$$T_{k+1} = C_8^k \cdot (-1)^k \cdot x^{\frac{6k-24+2k}{3}}$$

$$T_{k+1} = C_8^k \cdot (-1)^k \cdot x^{\frac{8k-24}{3}}$$

$$\frac{8k-24}{3} = 0$$

$$8k = 24$$

$$\underline{k = 3}$$

19204234

7) $x = ?$ $T_3 = 1000000$ $(x + x^{\lg x})^5$

$$T_3 = T_{2+1} = C_5^2 \cdot x^3 \cdot (x^{\lg x})^2$$

$$1000000 = \frac{5!}{2! \cdot 3!} \cdot x^3 \cdot x^{2\lg x}$$

$$1000000 = \frac{5 \cdot \cancel{4}^{2} \cdot \cancel{3!}}{\cancel{2} \cdot \cancel{3!}} \cdot x^{3+2\lg x}$$

$$\frac{10^6}{10} = x^{3+2\lg x}$$

$$10^5 = x^{3+2\lg x} \; / \lg$$

$$5 \underbrace{\lg 10}_{1} = (3+2\lg x)\lg x$$

$$5 = 3\lg x = 2\lg^2 x$$

$$2\lg^2 x + 3\lg x - 5 = 0$$

$$\lg x = t$$

$$2t^2 + 3t - 5 = 0$$

$$t_{1/2} = \frac{-3 \pm \sqrt{9+40}}{4} = \frac{-3 \pm 7}{4}$$

$$t_1 = -\frac{5}{2} \qquad t_2 = 1$$

t_1	t_2
$\lg x = -\frac{5}{2}$	$\lg x = 1$
$x = 10^{-\frac{5}{2}}$	$x = 10$
$x = \frac{1}{\sqrt{10^5}}$	

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8)

$$\left(x\sqrt[4]{x^3}+\frac{\sqrt{x}}{x^2}\right)^n$$

$C_n^4 = C_n^9$

$C_n^4 = C_n^{n-9} \Rightarrow$ ~~[illegible]~~ $4 = n-9$

$n = 13$

$T_{k+1} = C_{13}^k \cdot \left(x \cdot x^{\frac{3}{4}}\right)^{13-k} \cdot \left(x^{\frac{1}{2}} \cdot x^2\right)^k$

$= C_{13}^k \cdot x^{\frac{7}{4}(13-k)} \cdot x^{-\frac{3}{2}k}$

$= C_{13}^k \cdot x^{\frac{91-7k-6k}{4}}$

$= C_{13}^k \cdot x^{\frac{91-13k}{4}}$

$\frac{91-13k}{4} = 0$

$91 - 13k = 0$

$13k = 91 \quad /:13$

$\underline{k = 7}$

$\underline{T = 8}$

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